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A young coniferous forest of fir, spruce, and pine, with some hard maple and red oak in the foreground. Madeline Island, one of the Apostles.

One of the Apostles

Loel and Hanford Tiffany*

An early voyageur exploring the west end of stormy Lake Superior saw a number of islands. He counted a dozen. Being a devout man, he was perhaps reminded of the twelve men in another country at another time who were also buffeted by many storms, and named the group the Apostle Islands. It does not matter now that there are twenty-two islands instead of twelve.

One of the Apostles is Madeline Island. It may have had an earlier, different name, for this is the region of the "Chequamegon," once the center of a vast trading area of some 25,000 square miles. And some blond-haired Indians, reported in the seventeenth century, may mean that the area was not unknown to those intrepid Europeans who visited North America nearly ten centuries ago. The Chippewas, the Iroquois, and the Sioux, as well as others, fought endlessly here. The hardy priest and pastor comforted the sick, spread the gospel, and buried the dead.†

Madeline Island is the largest of the Apostles and lies in Chequamegon Bay some two miles from Bayfield, Wisconsin, and 75 miles from Duluth, Minnesota, by boat. The village of La Pointe was once a thriving city where fur trading, fishing, and many councils between braves and the paleface took place. The permanent residents of the island number less than 300 at the present time. Plenty of rain and a cool summer contribute toward luxuriant growth of grasses for hay. The growing season is too short for much grain farming except some wheat and oats, and dairying is the chief occupation on the farm. Fishing, especially "deep-sea" fishing, is a means of livelihood as well as a sport in both winter and summer. There are numerous summer homes overlooking the water and among the pines. Beloit College owns a 96-acre tract of land on which stands the Old Mission Inn built in 1832. The Old Mission Church collapsed in 1943 from the accumulation of snow on its roof.

Only a remnant of the once mighty Chippewas remains on the island, and these families live in the village of La Pointe. A small Indian reservation on the northeast end of the island has at present no permanent inhabitants. The cemeteries bear mute evidence of the history and customs of a by-gone era. In one of them lies Chief Buffalo, the "Chief of all the Chippewas of Lake Superior" who died in

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†Burnham, Guy M., *The Lake Superior Country in History and Story.* The Ashland Daily Press, Ashland, Wis., 1930.

1850 at the age of 96. Michel Cadotte, buried in 1840, had married the daughter of a local chieftain (Chief White Crane). The old chief gave his daughter the Christian name of Madeline when she was married, and this is the source of the name of the island. King Bell, who ruled Madeline Island during the fur-trading days of the nineteenth century with ruthlessness, benevolence, and an occasional departure from sobriety, once gambled with authorities to see whether the town's taxes should be paid. He lost. One wishes that some Nathaniel Hawthorne had been conversant with the history of Madeline Island.

The cemetery bears mute evidence of a race and of customs of a by-gone day.

The island was once covered with the finest trees the north woods could support. There were "giants in those days," even if Paul Bunyan is only a delightful myth, but they were white pines, hemlocks, yellow and white birches, and arbor vitae (white cedar). Lumbering and logging began some three-quarters of a century ago, and the destruction of the original forest has gone on intermittently throughout the years. Perhaps not a single giant among the white pines remains, but an occasional badly rotted stump furnishes the evidence of a former luxuriant growth. A few very large yellow birches and hemlocks may be found at present, especially on the Indian reservation.

The forest now is almost entirely second growth, with white and red pine, balsam fir, white spruce and some hemlock comprising the principal coniferous vegetation. On drier areas the red pine be-

comes abundant, and the southwest point supports a fine, pure stand some 75 to 80 years old. Young arbor vitae is common in the ravines, and tamarack grows sparingly in the swamps and bogs. Jack pine grows on the sandy shores, occasionally inland. Red oak, hard maple, white birch, and basswood constitute the bulk of the hardwoods among the sizable trees, although the aspen is the "woody weed" found throughout the island. In some places the hardwoods outnumber the conifers and in others they are merely the understudy. It is most surprising to witness the rapid intrusion of the aspen after clearings. In fact we saw an abandoned apple orchard that had all the appearance of a young aspen forest.

Along the rocky shore: aspen, pine, fir, and spruce.

The successions of vegetational communities after clearing follow pretty much the pattern common to the northern coniferous forest. After burning, the fire-weed (*Epilobium*) is a pioneer. In other clearings it may be the beech fern (*Phegopteris*) or the red raspberry, or sedges and cattails in the depressions. These are soon followed by aspen and other second-growth species mentioned in the preceding paragraph. In the swamps alders and willows and the delicate-looking tamarack "prepare the way" for the later more mesophytic trees.

The undergrowth throughout the island is of great interest to the botanist who has some acquaintance with shrubs and herbs, liverworts and mosses, club mosses, fungi, and slime molds. There is too much shade for many algae on the island, and the wind and the deep

water of Lake Superior prevent much algal growth along the shore.

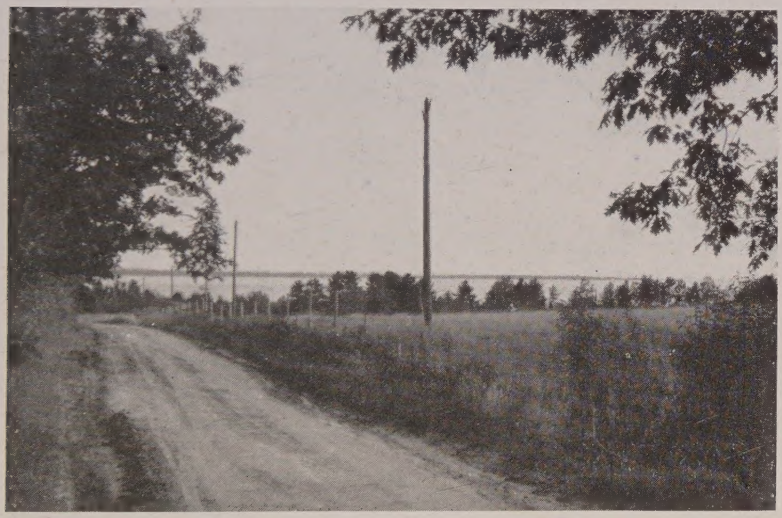
The yew, or ground hemlock, has been almost completely removed by the winter feeding of the deer. Luxuriant annual "crops" of hard maple and oak seedlings are also devoured by the deer. Sweet gale, whose leaves with their fragrant penetrating odor may be placed in clothes as moth-repellents, grows everywhere along the open waters of lagoons and swamps. The prostrate creeping juniper (*Juniperus horizontalis*) spreads over considerable areas along sandy shores, and is often associated with jack pine. Near the water's edge may frequently be found the curious knotweed with jointed articulated stems (*Polygonella articulata*). The privet andromeda (*Lyonia ligustrina*) occasionally found in the moist thickets seems far west of its general range.

Then there is the large-leafed aster (*Aster cordifolius*) occupying literally acres of semi-shady areas in the drier parts of the forest. Its large leaves are soon evident as a covering in spring, although it does not flower until August. One of the most interesting of the ground covers is the dwarf member of the dogwood family, dwarf cornel (*Cornus canadensis*), with its four to six whorled leaves and centrally placed flower cluster of four white bracts and numerous greenish flowers. In mid-August the scarlet berries appear as a closely-clustered bunch. It is locally known as the pidgeon berry. Heaths of many kinds occur almost everywhere conditions of sun and shade are favorable: wintergreens, trailing arbutus, blueberries, pipsissewa, pinesap and Indian pipe, bearberry.

The ground pines, club mosses, or staghorn mosses, as they are variously called, are represented by at least five species (*Lycopodium spp.*). The creeping species often reach lengths of six to eight feet. Mosses of all kinds abound on standing tree trunks, on fallen tree trunks, and on the ground. The hair-caps, the Mniums, the Hypnums, Climacium, Dicranum, and the pin-cushion (*Leucobryum*) are all here. Lichens—fruiticose, crustose, and foliose—beggar description. They are especially abundant on oak trunks and among the mosses, although few trees are without some encrustation. It would have been fun to have been a lichenologist.

Surely the mycologist—and we mean the dyed-in-the-wool fungologist—would become happily insane at the variety and abundance of the fungi. We arrived on Madeline in mid-July and the beautiful but deadly fly Amanita was everywhere. (For the sake of the record, we observed a chipmunk several times nibbling the Amanita cap, and it lived to come back for more! It seemed to have a preference, however, for other kinds of gill fungi, especially the stipes of Hygrophorus.) There were the horn of plenty (*Craterellus cornucopioides*), boleti, puffballs, the delicate wheel *Marasmius,* the milky *Lactarius,* and

everywhere, even in the roadbed, many coral fungi. The fairy rings sometimes cause ill-appearing dead patches in lawns and on golf courses. The following groups were all represented: gill fungi, tube fungi, shelf fungi, cup fungi, earth-stars, jelly fungi, club fungi, teeth fungi, puffballs, bird's-nest fungi. The fungi take their toll in the forest, securing sustenance from the living, the dying, and the dead. Evidence of destruction of root tissues, sapwood and heartwood was everywhere. Perhaps the white birch, among the standing population, was most colonized. When the trees become prostrate, however, there seems to be little or no specialization.



A meadow that was once a great forest. Jack pine along the shore. Long Island in the distance.

Parenthetically, it might be observed, on the basis of personal experience, that it is not wise to kick, strike with a cane, or otherwise disturb every clump of lichens or fungi or mosses that may be suspended from partially fallen tree trunks. One of these "plant" clumps turned out to be a hornet's nest. Incredibly rapid retreat through dense underbrush confused the "enemy," apparently, and we escaped unscathed, or at least unstung.

The slime molds were "running around" everywhere, on sticks, on blades of grass, on sawdust piles, and on logs. This curious group of plant-like and animal-like organisms, variously called Myxothallophyta, Myxophyta, and Mycetozoa, possesses a vegetative body consisting of a naked amoeboid mass of protoplasm. It may be a many-

nucleate protoplast (plasmodium) or a group of many uninucleate protoplasts (pseudoplasmodium). The fruiting bodies often have definite form, marvelous architecture, and beautiful color.

Berry picking on Madeline is both varied and profitable. In late June and early July the wild strawberry plants carpet the exposed ground along roads and in cleared areas. The fruit is large, plentiful, and delicious. Hardly is the last strawberry gone when blueberries are ripe, growing in almost any situation with plenty of moisture and not too much shade. A mixture of blueberries and wild strawberries with cream and sugar is a dish one scarcely forgets. And of course there are blueberry muffins. In August the red raspberry plants, which come in rapidly and occupy the cleared ground on many parts of the island, are in fruit. A little later the bogs and swamps afford cranberries. Blackberries and dewberries are to be found, but not plentifully.

The animal life on Madeline is numerous but not much varied. Deer are everywhere, even coming to graze in meadows and lawns. Food for them is scarce during the deep snows of winter, and the government provides for some feeding. It seems necessary to keep the deer from multiplying too rapidly, and open season for a few days occurs in the fall. As many as 300 hunters are reported as visiting the island in a single day. An albino doe, some five years old, is known to be on the island, although we did not glimpse her. We were told that bear might be expected, but although we occasionally became lost in the woods, we never encountered one. Chipmunks are all over the place, and the cunning little, big-eared field mouse is abundant. The "golden-breasted woodpecker," a name used by the Indians for the flicker, is much more abundant than in the Chicago area. One lonely loon was seen some distance from shore, but we did not hear the wierd cry.

Madeline Island is indeed a pleasant vacation spot. Fish are plentiful, swimming is good, golfing is available, and the temperature seldom goes above the lower eighties in summer. To the botanist is added the offerings of the forest and the opportunity of studying plants firsthand, away from the beaten path, the madding crowd, and other annoyances of civilization.

The Paraguayan Pantanal

Karl P. Schmidt*

Those zoologists who have concerned themselves with the study of the principles and problems of animal geography, and thus with the agencies involved in the dispersal of animals from one continent to another and to the oceanic islands, have been driven to the hypothesis that at least a part of such dispersal is dependent on the raft-like floating masses of vegetation that are carried out to sea by the great tropical rivers. This is by no means the only agency of what is referred to as fortuitous or accidental dispersal, but it appears to require consideration in any account of animal geography, and to merit further observation. It was my good fortune, in the course of a collecting expedition for the Chicago Natural History Museum in 1926, to visit the vast marshes of the upper Paraguay known to the Brazilians as the "Pantanal" and to learn at first hand something about the origin of such rafts of floating plant material.

The level floating marsh and fringe of trees at the edge of open water.

Most of us remember from our schoolday geography lessons the "La Plata River," which turns out to be no river at all, but merely the bay into which the Uruguay and Paraná, which are proper rivers, empty their waters. The Paraná, in turn, is composed of two branches,

*Chief Curator of Zoology, Chicago Natural History Museum. Photographs by courtesy of the Museum.

both much longer than the course of the main river below their juncture, the Paraguay to the west, and the "Alto Paraná" to the east. Of these, the Paraguay is somewhat better known, so that the main stream below the union of the two branches may be known by either name, as for example in the Encyclopedia Britannica, where Paraná appears on the map while the river is referred to as the Paraguay in the text. Whatever the name of the main stream, the whole river is one of great volume and importance, the second largest river system in South America. Both the Paraguay and the Paraná rise far inland in Brazil, the Paraguay interdigitating with the southern tributaries of the Amazon, the Paraná with the head waters of the San Francisco. The main stream and the branches as well are the scene of a varied river traffic, with steamers larger than those of the Mississippi plying between Buenos Aires and Asuncion, and vast rafts of logs floating downward to the lumber mills of Rosario.

Above the junction of the two great branch rivers at Corrientes, the Paraguay flows through a great undulating plain known as the Argentine, Paraguayan, and in turn Bolivian Chaco. Much of this region is a true savanna, marked by alternating grassland and marsh with galleries of forest along the streams and with occasional small islands of forest set on the greatly rolling plain. Often there is an open growth of a characteristic palm. The level of the Chaco is only a little above that of the rivers intersecting it on their way from the Andes to the Paraguay, and great areas are subject to overflow. Here and there, in its meandering course through this vast plain the Paraguay touches on high ground, as at Fort Olimpo, the first Brazilian post above Paraguay.

Still farther up stream, the level of the plain is even less elevated above the low mark of the river, and the savanna gives way to extensive marsh and swamp, surely one of the great river marshes of the world. At more than a thousand miles from its mouth the level of the Paraguay is still less than 500 feet above the sea. This great swamp area, where hundreds of square miles present the striking landscape of floating mats of grass and water hyacinth, is known to the Brazilians as the "Pantanal." Like other great silt-bearing rivers, the Paraguay builds up natural levees along its banks well above the level of the river. These higher river banks bear a fringe of vine-clad trees, through which the river traveller may catch an occasional glimpse of the vast open pantanal extending as far as he can see. When the river changes its course, such former river banks are left as a network of linear islands and embankments.

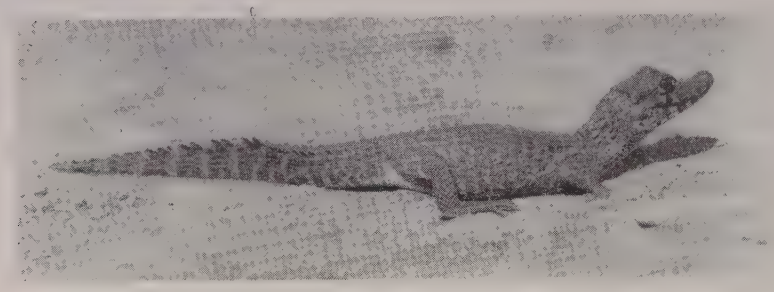
At Corumba the river reaches the 200-foot bluff of high ground that bounds the western side of the river bottom. Corumba is an

inland metropolis serving as the center of distribution for the Brazilian state of Matto Grosso (in which even Texas would be lost) and all eastern Bolivia as well. From the high ground at Corumba one may look over the pantanal, with the distant blue hills of Amolar at the north, while to the east the perfectly level marshy plain extends to the horizon, intersected only by the winding silvery bands of the rivers Paraguay and Cuyaba.

Our rowboat working through the camelotte.

These marshes and the solid banks built up by the river are the home of an innumerable host of aquatic mammals and birds, and the occasional strip of solid land brings the animals of the drier plains within its borders. The jabiru, a gigantic stork, whose bare neck is boldly colored red and black, stalks along the edges of the streams. Crested screamers cry from the thickets that border the open water or from the savanna beyond. Brilliant kingfishers dart out from an overhanging limb to essay a dive, or to fly ahead of the oncoming steam launch. Flocks of the beautiful wood ibis and great numbers of herons and egrets are to be seen at every turn. The mournful wail of the limpkin is the most dominant of the night sounds. Caimans (the alligators of South America) sun themselves on open places on the mud banks, and slip into the water only when shot at by the passing traveller. The large mammals most characteristic of the riverbanks

are the tapir, the swamp deer, and the more aquatic capybara. In the water itself one may see the coypu, an otter-like rodent whose fur, as nutria, is better known than is the animal; and there is also the large South American river otter, which may play around the river steamer.



Juvenile specimen of the Paraguay caiman *(Caiman yacare)*.

Wherever there is a stretch of land dry during low water, high conical termite nests are an invariable feature of the landscape. The development of the nest society by the "white ants," even more complex than the social structure of the true ants, is nowhere more in evidence than in the open country in Brazil, which borders the great Amazonian rain forest to the south. On the overflowed land of the upper Paraguay basin, two types of earth nests are especially in evidence. One is symmetrically conical, a foot or so in diameter at the base, and rising from four to six feet to a sharp peak. These are extremely numerous, and are frequently scattered through the grass, or along the river bank, where their nearly black color makes them conspicuous. Their height evidently provides a refuge for the colony in the upper level of the nest in time of flood.

Farther up the river the continuous marsh gives way to a gently undulating plain, with marshes in all the hollows, with alternating grassland and open forest of medium height. In the midst of the meadows are numerous islands of scrubby trees, with cactus and a spiny plant of the pineapple family as ground cover, sharply set off from the grass, and rising a few feet above the surrounding level. These islands of timber invariably have a large grey termite nest at their center, often eight feet or more in greatest diameter and as much in height. The most probable conclusion is that these nests have produced the hillock, with its attendant special vegetation, by the steady erosion of the nest by rains, with constant reaccumulation by the termites. These nests, and their successive termite colonies must have had a continuous existence for hundreds or even thousands of years. Thus these frail insects, which never venture willingly into the light,

have modified the topography of the region to create a most striking type of savanna landscape.

The most characteristic feature of the swamp itself is the production of vast mats of floating vegetation, composed principally of a coarse grass with finger-thick stems and of two or three kinds of water hyacinth. The floating material is known as "Camelotte." Mats of it may choke the river channels completely, greatly obstructing navigation The launch on which we travelled in 1926, on reaching Lake Gaiba on the Bolivian border, found no inlet up which it might proceed and circled the lake completely, trying one bay or channel after the other. We were in the end compelled to wait for the regular river boat whose captain knew the channels whether choked or not. This, with its sidewheels, plowed its way through the mat of weed that had choked and entirely concealed the main channel.

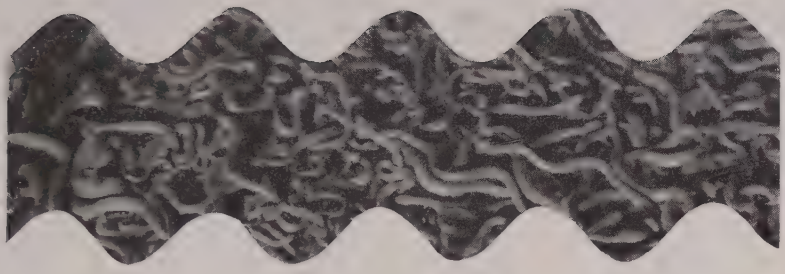
Steam launches of the upper Paraguay working their way through the floating vegetation.

The camelotte has an interesting animal life of its own, besides its occasional passengers. Tiny frogs live among the grass stems, and sing the traveller to sleep when the boat is tied up for the night. Juvenile caimans take up their residence on it. Most charming of all its animals are the small catfishes, which cling to the submerged stems of the water hyacinth, never seen unless one shines their eyes with the flashlight. When disturbed, instead of swimming away like a

normal fish, they merely change sides on the stem, on which they move backward and forward and sidewise with equal facility.

While we were tied up at the river bank for our first night above Corumba, Colin C. Sanborn, of our expedition staff, joined me in the large rowboat attached to our launch. We cast loose and dropped down river at the edge of the floating vegetation, listening for voices and searching for the vocalists. We found first a pale brown toad (*Bufo typhonius*) with its head ornamented by curious wing-like flat bony projections; its weak voice was amplified among the rounded floats of water-hyacinth and given a ventriloquial character so that it was curiously difficult to trace. By far the most abundant of the swamp frogs were two hylas—a large one (*Hyla spegazzinii*) with long legs sharply crossbarred with black, and a minute species (*Hyla nana*), which was present in countless numbers. Both of these frogs are quite characteristic of the Chaco and Pantanal, and apparently range also to northeastern Brazil via the corridor of savanna and swamp that separates the Amazonian rain forest region from the forested mountains of southeastern Brazil. We also obtained a couple of juvenile specimens of the Paraguay river caiman (a small alligator-like crocodilian). These were found by the glowing red reflection of our flashlights from their eyes. With our attention so closely focussed on the vegetation beside our boat, we failed to see that a vast mat of the pantanal vegetation had broken loose somewhere up river, swept past the launch, and completely blocked the channel above us; we had visions of returning to Corumba by rowboat, subsisting upon a diet of raw tree frogs. Fortunately we found that where the new mat of water hyacinth met the old one along the river bank, the passage was still negotiable; and with great effort we pushed and pulled ourselves back to our party on the launch.

It is the floating mats of camelotte that form a means of downriver dispersal of all kinds of animal life. They are usually thick enough and strong enough to support even a large mammal. When sections of the camelotte become detached and are carried downstream in one of the open channels, they may bear a great variety of animal life and such rafts frequently retain their identity as far as the junction with the Paraná. This is especially the case when a flood drives land animals from the more solid land to temporary refuge on the floating vegetation, and it is in flood periods that rafts of this material are most likely to float away downstream. During the extremely high water of 1905, such rafts carried a variety of caimans, poisonous snakes, and even mammals as far seaward as Montevideo. Since the Paraguay and Paraná reach the sea in a temperate zone, their rafts of vegetation can scarcely contribute to transoceanic dispersal of tropical animals. They do, however, ensure a great uniformity of life over the vast area from the headwaters of the Paraguay to the northern Argentine.



The Problem of Too Many Snakes

H. K. Gloyd

Sometimes animal populations interfere with man's activities to an objectionable extent. Since man, too, has a place in nature, he objects to this and usually tries to do something about it. Such interferences may range from a mild nuisance, detracting from his comfort or peace of mind, through many stages of lessening his economic progress to an actual menace to his personal health and safety. Efforts to "control" these objectionable relationships with animals depend upon the extent of the annoyance or menace and upon knowledge of the way of life of the offending species. Conscious at first only of the pain caused by a mosquito, we slap the pesky biter on the spot, but when we become aware of the insect's role as a carrier of disease, we study its habits and devise elaborate methods for destroying it by attacking the most vulnerable stage in its life cycle.

With the exception of the dangerously poisonous species, snakes seldom interfere with human activities enough to require serious attempts to reduce their abundance. Nevertheless, man is, and probably will continue to be, the snakes' most merciless enemy. He applies the oppressive heel to the head of the serpent indiscriminately, despite the efforts of naturalists to learn and tell the truth about these animals. Superstitious beliefs and myths about snakes have been attacked in hundreds of treatises—both popular and technical, by word of mouth in classrooms and public lectures, by demonstrations, and by experiments; but, so deep-seated is the prejudice that even among intelligent people there are some who—with reference to snakes—refuse to accept the science of biology as anything more than a word in the dictionary.

MOST SNAKES ECONOMICALLY BENEFICIAL

It is true that garter snakes and water snakes eat fishes and frogs, that hog-nosed snakes eat toads (which are generally accepted as bene-

ficial garden guests), that bull snakes, black snakes, and "chicken snakes" occasionally eat birds and birds' eggs, but only in a few cases is there evidence that these items of diet constitute these snakes' main choice as food. The majority of species of snakes are known to feed chiefly upon earthworms, slugs, insects, spiders, salamanders, small frogs, lizards, other snakes, mice, rats, ground squirrels, gophers, rabbits, and other small mammals. Studies made at the Kansas State Agricultural Experiment Station some years ago[1] indicated that a five-foot bull snake has the potentiality of destroying annually all pocket gophers in one and one-half acres of alfalfa moderately infested with these injurious rodents. Even the poisonous copperheads, moccasins, and rattlesnakes feed chiefly, or to a large extent, upon small mammals and were it not for the menace of their venoms would merit protection as natural enemies of rodent pests. From a purely economic view, the indiscriminate killing of all snakes is as ridiculous and short-sighted as killing all hawks because a few have a fondness for song birds and young poultry.

Many people know this and make an effort to protect beneficial species but there are, of course, times and places when and where too many snakes are *personae non gratae*. Dangerously poisonous snakes definitely do not belong among human habitations, and sometimes non-venomous species are legitimately unwelcome. Water snakes are not wanted in a fish hatchery and an over-abundance of egg-eating snakes is undesirable in a game bird preserve. Also, it seems, there are situations in which too many snakes, even of species admittedly innocuous, disturb the peace of the human mind. Letters come to museums saying, in effect, "I know that the garter snakes in my garden are harmless, and probably even do good, but they startle me when I see them, for I just don't like snakes! How can I get rid of them?" So, apparently, we should have methods of control, of eradication. Herpetologists are often asked if there are not specific poisons, repellents, traps, or other means of eliminating these slithering creatures.

The problem is a difficult one and should be approached with caution and without bias. No large-scale campaign of eradication against any animal population—not even snakes—should be initiated without first being sure that a real nuisance or menace actually exists, and that some form of control is necessary to the welfare of the human population concerned. Legislative bodies and other agencies considering such a problem should obtain the services of competent biologists trained in the study of the inter-relations of animal species and be guided by their findings. Such a policy can avert a waste of effort and money and

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[1] Hisaw and Gloyd, *Journ. Mammalogy*, vol. 7, 1926, p. 200-205.

the great harm to wild life that may result from misguided practises based upon inadequate knowledge or inaccurate information.

Methods of control effective against undesirable animal populations are contingent upon some aspect of the habits of the unwanted species: its food, shelter, or life cycle. Of snakes the habits of many species are virtually unknown. Even for those which have been studied in some detail the data are scanty in comparison with what is known of the general natural history of birds, mammals, and fishes. Satisfactory methods of control may not be possible until our knowledge of the biology of these reptiles has been substantially increased and even then may not

The bull snake *(Pituophis sayi sayi)*, beneficial because its food consists chiefly of injurious rodents, is a common species widely distributed in the central United States.

be advisable, for procedures effective against snakes are likely to eradicate many other animals at the same time. Meanwhile, however, we may consider some of the methods which have been tried or suggested.

SPECIFIC METHODS OF CONTROL

Obviously the most simple and direct method of eliminating snakes is to kill them individually on sight by whatever means is most convenient. Too many people do this as a matter of course without thought as to whether the snake is harmless, useful, or potentially dangerous, and the satisfaction of a latent lust to kill something is often the single motive. When the idea of "control" enters into consideration other means are usually sought.

Poisoning is frequently considered and sometimes tried. One method, the use of poisoned food, is not satisfactory because of the peculiarities of snakes' feeding habits. Snakes do not need to eat regularly and they are often particular about what they eat. On the basis of knowledge gained from the examination of stomach contents (scanty because most snakes' stomachs are empty when dissected), from occasional observations in the field, and from the food eaten by captives, it may be safely stated that snakes are carnivorous; i.e., they eat only animal food. Although they sometimes eat dead animals, occasionally even carrion, they generally prefer living prey which they kill in their own way: by constriction, by biting it to death, by swallowing it alive, or by means of venom. Captive snakes sometimes can be persuaded to eat pieces of dead fish or chunks of meat, but it is doubtful if such baits would be taken in the freedom of out-of-doors. The impracticability of poisoned food as a control method is obvious.

It is said that egg-eating snakes may sometimes be killed by poisoned eggs[2] (crystals of strychnine are introduced through a hole in the shell of a fresh egg, the hole pasted over with paper and allowed to dry), but who wants to put poisoned eggs in a chicken house?

Another use of poison is to kill snakes which have taken refuge in ground-squirrel or prairie-dog burrows. Field employees of the Fish and Wildlife Service have used this method on rattlesnakes.[3] About two ounces of crude calcium cyanide are placed well down in the burrow by means of a ladle or long-handled spoon and the entrance closed by a stone or piece of sod. The effectiveness of this chemical depends upon the relative humidity, for moisture in the air is needed to combine with the cyanide and liberate hydrocyanic-acid gas (a deadly poison for animals in general, including man) which diffuses in all directions and may remain active in the burrow for several hours.

The use of nonpoisoned baits has been suggested. Water snakes have been caught by means of small fishes attached to cords and dropped into the water, and frog-eating snakes by tethering a live frog to a stake. These methods are in the class with a small boy's fishing with a bent pin; they appeal to the perennially youthful and to herpetological collectors who will try anything.

Chemical repellents of various kinds have received consideration but do not appear likely to be useful. The possibilities in this field have been by no means exhausted and further investigations might be profitable. Snakes seem to be immune from the effects of such gases as phosgene, chlorine, and tear chemicals.[4] We do not know what smells bad to a snake. The sense of smell of these animals is undoubtedly important but it may differ from ours. An instance was once reported

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[2, 3, 4] U. S. Dept. of the Interior, Fish and Wildlife Service, Wildlife Leaflet 257, 1944, p. 7-9.

to me—I do not say that I believe it—of a pilot black snake's swallowing a nest-egg made of naphthalene.

Trapping is a method with possibilites not yet fully explored. No one, to my knowledge, has devised a trap or snare that can be "set" for snakes, although trapping at dens is possible and will be discussed later. Water snakes have been known to enter minnow traps of the commonly used funnel variety. Collectors of mammals have occasionally found snakes caught in mouse traps, but this can be regarded only as the result of accident. Traps depending upon food as bait would be subject to the difficulties of providing enticing food in combination with a mechanical device suitable for capturing the snakes. If some ingenious spirit ever contrives such a gadget, he will receive applause, at least from herpetological collectors.

Snakes often fall into such enclosures as cisterns, old wells, reservoirs, and concrete irrigation ditches, and collectors have long capitalized on these situations to their advantage. Another control measure, based on this principle is to "dig pits three or more feet deep with vertical sides and place several live frogs or mice in them for decoys."[5] In apocryphal snake-lore, pits are supposed to be irresistible to impoverished hissing snakes, but as a control measure they would probably not justify the requisite spade work, even in the back yard.

One of the simplest and surest ways of reducing the number of snakes in a given area is to remove their shelter. It should be remembered that snakes do not spend their time roaming the surface of the earth, like Satan, seeking whom they may devour. They must find protection from low temperatures in winter and from high temperatures in summer. They must have refuge from their enemies. Snakes commonly take shelter beneath loose slabs of rock, boards, piles of bark, brush, logs, fence posts, straw, leaves, stones, old roofing paper, corrugated iron, burlap, paper cartons, and miscellaneous debris of all kinds. For every single snake encountered in the open in the course of its daytime activities collectors find dozens in such concealment. Removal of all such objects and the maintenance of a general neatness, such as is normally characteristic of well-kept grounds, will go a long way towards the discouragement of snake populations.

Old buildings attract snakes because they afford shelter not only for the snakes themselves but also for the small mammals upon which the snakes prey. Buildings can be "snake-proofed" by keeping doors and windows screened and seeing that all openings in the walls, floors, and foundations are suitably closed. Basement walls should be tightly con-

[5] Wildlife Leaflet 257, p. 9.

structed and foundations under houses, barns and other buildings "pointed up" with cement.

At the Boyce Thompson Southwestern Arboretum near Superior, Arizona, dwelling houses are surrounded by "snake-proof" fences of galvanized hardware cloth, ¼-inch mesh, 36 inches wide, set 6 inches in the ground. Whip snakes sometimes go over the top by climbing bushes, and bull snakes sometimes get under by taking advantage of the work of burrowing mammals. If the tightly fitting gates are kept closed, and the burrows which mammals dig under the fence are watched for and stopped promptly, rattlesnakes, at least, are excluded.

ERADICATION AT DENS

The most effective methods of eradicating snakes in large numbers take advantage of the hibernation of these animals. In temperate regions snakes usually aggregate for the winter in areas which afford especially suitable shelter. If the aggregation is definitely localized it is referred to as a "den." It must be kept in mind, however, that in some regions snakes do not "den-up" in the usual sense. Sometimes they simply take winter refuge in the numerous crevices in rocky ravines and the hibernating aggregation is diffused throughout a considerable area. At other times they hibernate singly or in small groups in whatever shelter is available: beneath accumulations of leaves or rubbish, in small burrows, under buildings, or in old wells. Typical dens are most often found in rocky or mountainous country where cavities or caves are used, or in prairie or plains regions where burrows dug by mammals furnish suitable shelter.

In the fall snakes often congregate in the vicinity of the dens until the temperature falls sufficiently to drive them inside. In the spring they usually remain near the dens for a few days before scattering into the surrounding territory in search of food. At these times they can be destroyed by clubbing or shooting.

Under some circumstances established dens can be more or less totally eliminated. In one instance, all entrances to a cavity in a limestone cliff were sealed with concrete after the snakes had entered in the fall. In another case, mustard gas was pumped into the crevices of a bed of lava rock, the snakes driven out in a dazed condition and killed with clubs.[6] Calcium cyanide would probably be effective in dens if it could be introduced in sufficient quantity in the proper places and the gas confined.

In Montana some years ago a large number of prairie rattlesnakes (*Crotalus viridis viridis*) was caught at a rocky den by sealing up all

[6] Wildlife Leaflet 257, p. 8.

the exits but one. In this crevice a piece of galvanized drain pipe was cemented with the outer end projecting into a box-like enclosure. The snakes emerged through the pipe and dropped into the box. This method has a limited application but its effectiveness is obvious.

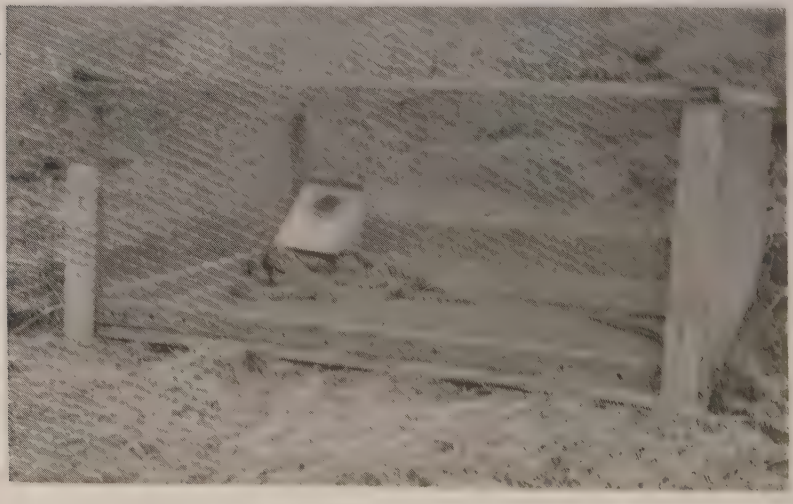
Rattlesnakes *(Crotalus atrox)* in a cave near New Braunfels, Texas. This is not a hibernating aggregation but rattlesnakes are known to enter this cave, and others in the vicinity, for winter shelter. Flash bulb photo by H. K. Gloyd.

Large-scale operations for the eradication of rattlesnakes have been carried on for several years by the state of South Dakota. Prairie rattlesnakes were sufficiently numerous to be regarded by residents of that region as a serious menace to live stock, ground-nesting birds, and human beings. Accordingly, the South Dakota Department of Agriculture employed A. M. Jackley of Pierre to study the habits of this species, devise methods of control, and train farmers and ranchers in a program of extermination. This work has resulted in the development of a highly efficient trap for catching snakes as they leave their dens, especially dens which are in burrows or cavities in the ground. As described by Mr. Jackley in a recent publication,[7] the method consists of closing all openings of the den except the one at which the trap is set. Holes opening into the den may be closed best, he states, by small squares of 1 x 6-inch boards set deeply in the ground and covered with screen wire. If this is impractical, he recommends a screen

[7] *South Dakota Conservation Digest*, vol. 10, 1943, no. 6, p. 1, 7.

wire fence entirely surrounding the area of the den. The wire should be 30 inches wide, set about 4 inches in the ground, and made to slant inward to prevent the snakes from going over it.

The trap is a box-like wooden frame, 32 x 40 inches and 16 inches high, covered with screen wire. Passing through one end of the cage is a small wooden chute, the outer end of which is cut square and the inner end at a 45 degree angle (see illustrations). The outer end connects with the exit from the den, or the enclosure around the den area, and the other end projects into the trap. This inner end is covered with a board having a one and one-half inch hole, the entrance to the trap. The entrance hole is covered with a square piece of celluloid, transparent plastic, or mica, hinged at the top but free at the bottom so as to form a one-way valve or gate. The snakes leaving the den enter the chute, pass through the hole into the cage, lifting the transparent gate, which requires only slight pressure and closes automatically after them. The hole is best placed near the top of the chute so that a snake coiled in the way will not block the entry. The chute should



Snake trap designed by A. M. Jackley for eradication of rattlesnakes in South Dakota. A square of transparent plastic or mica, hinged at the top, covers entrance hole on the end of a wooden chute leading into the trap from an exit of the den. Photo by courtesy of A. M. Jackley

enter the cage three or four inches above the floor level so that snakes in the trap can not easily pile up in front of the entrance and prevent others from coming in.

Mr. Jackley states that this method of trapping has been thoroughly tested and found successful. Thousands of rattlesnakes have been caught by this procedure. In addition harmless and beneficial snakes, such as bull snakes, blue racers and garter snakes, hibernating with the rattlesnakes, are of course also caught. Mr. Jackley instructs

A "kill" from one of the traps. In addition to the rattlesnakes, numerous harmless and largely beneficial species (bull snakes, blue racers, and garter snakes) hibernating in the same den have become victims. Not only man is judged by the company he keeps. Photo by courtesy of A. M. Jackley.

his collaborators to kill only the rattlesnakes, but need for discrimination is hard to impress, and it must be remembered that all of these snakes, including the rattlesnakes, constitute an important natural agency in the control of injurious rodents such as ground-squirrels, prairie-dogs, and pocket gophers.

NATURAL ENEMIES OF SNAKES

Snakes have many natural enemies which prey upon them and keep their numbers small. Among the mammals, excluding man, hogs probably rank first as destroyers of snakes. Badgers, skunks, opossums, foxes, and coyotes frequently feed upon them. Deer are said to kill them by stamping them with their feet. Domestic cats and dogs occasionally attack them. The Old World mongoose is a notorious killer of snakes, but wherever it has been introduced outside its native habitat it has become obnoxious itself. Its importation into the United States is prohibited by law.

Among the birds many hawks feed upon snakes, some to a considerable extent. Domestic chickens and turkeys have been known to kill and eat them, even small rattlesnakes.

Snakes themselves must be listed among these natural enemies. Those in the United States most addicted to eating other snakes are the king snakes (*Lampropeltis*), whip snakes (*Masticophis*), eastern black snakes and blue racers (*Coluber*), and indigo snakes (*Drymarchon*). All of these are known to eat venomous as well as nonvenomous species. The bull snake (*Pituophis*) is said to kill rattlesnakes, but this is a questionable statement, which may have originated through confusion of this species with some of the king snakes.

The encouragement of these natural enemies whenever possible is an indirect but nevertheless positive means of keeping the abundance of snakes within reasonable limits.

SNAKE POPULATIONS MAY BE CYCLIC

Although "peaks of abundance" at more or less regular intervals have not been demonstrated, populations of snakes vary from season to season. These fluctuations, due in part to variation in food supply, enemies and disease, may be cyclic in nature. If your garden is "full of garter snakes" this spring, it probably will not be so next year, and perhaps not for several years to come.

THE STUDY OF SNAKES

It has been pointed out above that knowledge of the natural history of snakes is exceedingly scanty in comparison to what has been learned about other groups of vertebrate animals. There is need for much careful observation of their habits and behavior in the field, and for experimentation on snakes. There is need for the accumulation of more preserved specimens for the study of structural and geographic variations, and for the use of taxonomists who are striving for more accurate descriptions and definitions of species and subspecies. By sending snakes—alive or preserved, with a statement of the locality in which they were caught—to museums which maintain reference collections for study, one can help effectively to advance this phase of science.

Many amateurs find the study of snakes extremely interesting. Some of the most useful contributions to our knowledge of these animals are being made by non-professional zoologists. If snakes are plentiful in your vicinity, why not get to know them and discover if eradication is really necessary or even desirable? Read some reliable books

about snakes.[8] Perhaps your peace of mind is needlessly disturbed. A very old lady in the South, when the truth about the "horn snake" was explained to her, sighed and remarked with a slow smile, "For nigh onto eighty years I've been scared of that snake. Think how much happier I'd a-been if I'd always known what you have just told me!"

King snakes, well known natural enemies of snakes in general, are quite as willing to feed upon poisonous as upon harmless species. Here an Arizona king snake is eating a rattlesnake just killed by constriction. Photo by Roy Komarek.

For those vexed with the problem of too many snakes—assuming that they are not of the bottle-induced varieties—some of the methods of control discussed above may be applicable. If none of the indirect means of eradication can be used, I can only repeat the recourse of killing them individually on sight, in the most convenient way. But again I urge discrimination: give the harmless, beneficial ones a chance to go on eating mice and pocket gophers. This is "good business" and good sense.

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[8] The following are recommended: *Snakes Alive, and How they Live,* by Clifford H. Pope, 1937, The Viking Press, New York; *Snakes and their Ways,* by C. H. Curran and Carl Kauffeld, 1937, Harper & Bros., New York; *The Reptiles of North America,* by R. L. Ditmars, 1936, Doubleday, Doran & Co., Garden City, N. Y.; *Field Book of Snakes of the United States and Canada,* by K. P. Schmidt and D. D. Davis, 1941, G. P. Putnam's Sons, New York; *The Reptiles of Ohio,* by Roger Conant, 1938, The University Press, Notre Dame, Ind.; *Amphibians and Reptiles of the Chicago Area,* by Clifford H. Pope, 1944, Chicago Natural History Museum, Chicago 5, Ill.

Sunday Afternoon Lectures - Winter, 1945

January 7

Polar Cruise

Illustrated with colored slides

JOHN R. PHILP

World Traveler, Lecturer—Chicago

January 14

Glacier National Park

Kodachrome motion picture with recorded music

VICTOR H. SICKINGER

Photographer—Wilmette

January 21

Chicagoland in Color

Kodachrome motion pictures and slides with recorded music

LEON F. URBAIN

Architect, Traveler, Lecturer—Chicago

January 28

Rambling with a Geologist

Illustrated with Kodachrome slides

ELMER R. NELSON, JR.

Geologist, Lecturer

Milwaukee Public Museum

February 4

Southwest Wonderland

Kodachrome motion picture with recorded music

RAY EGGERSTED

Traveler, Lecturer—Elgin, Illinois

February 11

Journey Across Mexico

Kodachrome motion picture

MICHAEL R. FORTINO

Photographer, Lecturer—Chicago

February 18

Scenic Beauties of Our Western Mountains

Illustrated with Kodachrome slides

LOUIS J. TINT, M. D.

Chicago

February 25

Salmon and Elk

Conservation of wildlife on the Columbia River and at Jackson Hole, Wyoming

Kodachrome motion picture

WESLEY F. KUBICHEK

Fish and Wildlife Service

U. S. Department of the Interior

Museum Activities

Sunday Afternoon Lectures - Winter, 1945

The winter series of Sunday Afternoon Lectures started January 7 and will continue through February 25, 1945. As usual, the public is invited to share these free programs with members of the Academy.

A section of the best seats is set aside for members of the Academy and their guests. Only the number of seats *reserved in advance* is roped off. In view of the fact that average attendance in 1944 was 82% larger than in 1943 and has tripled since 1940, members will understand the necessity for their being asked to limit reservations for the current series to *two* per lecture on *Associate* memberships and to four for active members.

Reservations may be made by writing or telephoning the Academy office (LINcoln 0606) by noon of the Saturday preceding each lecture. On arrival for a lecture, please *check* your reservations at the table in the lobby, where you will receive passes to the reserved section. Reservations are held only until the lecture starts, at three o'clock.

It is requested that those in attendance do not bring children, since limited auditorium facilities make it difficult to accomodate the adult audiences for whom the Sunday programs are designed.

Camouflage in Nature Winter Exhibit in Lobby

A temporary exhibit, which will be on display in the lobby of the Museum until the end of March, demonstrates principles of camouflage as exemplified by animals: mimicry and protective resemblance, counter-shading, picture-patterning, and ruptive markings.

Man's wartime application of these principles of disguise is illustrated by a ski-trooper's outfit (loaned by the Chicago Quartermaster Depot of the U. S. Army), a jungle fighter's patterned suit (courtesy of the U. S. Marine Corps), and a series of diagrammatic plates, *Experiments in Camouflage*, prepared by students at the Institute of Design in Chicago.

Audubon Society Lectures

Alexander Sprunt, Jr., southern representative of the National Audubon Society, presented a color movie-lecture, *Wildlife from Texas to Chicago*, on Friday evening, January 5. On Friday, February 9, at eight o'clock, Murl Deusing of the Milwaukee Public Museum will show his film, *Bright Feathers*, on the bird life of Door County, Wisconsin.

P. S. A.'s 1944 Nature Salon Exhibited at Academy

The outstanding collection of nature photographs comprising the 1944 Salon of the Nature Division of the Photographic Society of America was on display during the past month in the lobby of the Academy's Museum, where it attracted a great deal of attention and favorable comment from museum visitors. Concurrently the Pictorial Division of the Salon was exhibited at the Museum of the Chicago Historical Society.

The ninety-eight prints displayed at the Academy represented a wide range of nature interests and photographic techniques. The judges are to be commended for the topical balance, scientific worth, and technical excellence of the collection, selected from some four hundred prints submitted in this division.

Cowles Botanical Awards

At a meeting of the Cowles Botanical Society held December 14, winners of the Henry Chandler Cowles Award for 1944 were announced by Sister Mary Ellen O'Hanlon, president of the society. First place, an award of $25 made possible through the generosity of Dr. Charles A. Shull, past president of the society, was received by William A. Jensen, 2051 North Kedvale Avenue, for his paper, "The Effects of Radioactive Chemicals on Plants." Copies of *Fundamentals of Plant Science*, by Sister Mary Ellen O'Hanlon, were presented with the compliments of the publisher, F. S. Crofts & Co., as second place awards to Paula Hallock and Binah Schor, Sullivan High School, for their paper, "Experiments with Molds; a report on the morphology, reproduction and reactions of molds to different culture media." Miss Kathleen Tyler, Visitation High School, received special honorable mention and an author's copy of *Fundamentals of Plant Science* for a paper entitled "The Effect of Soil on Plant Growth."

The Henry Chandler Cowles Award has been offered for the past two years to high school students of the Chicago area for "excellence in original work in botany, either observational or experimental." Judges of this year's papers included Dr. H. K. Gloyd, director of the Academy's Museum, Father John B. Murphy of DePaul University, and Anna Pedersen Kummer, treasurer of the society and honorary curator of botany at the Academy.

A. M. Bailey Honored

Alfred M. Bailey, director of the Colorado Museum of Natural History, Denver, has received the honorary degree of Doctor of Science from Norwich University, Northfield, Vermont, for distinguished service in natural history. Dr. Bailey was director of the museum of the Chicago Academy of Sciences from 1927 to 1936.

Recent Visitors

Representatives of other museums who visited the Academy recently are Emil P. Kruschke of the department of botany, Milwaukee Public Museum; Dr. Arthur C. Tuomey, division of ornithology, Carnegie Museum; and Miss Helene Azevedo, librarian, Museu Nacional, Rio de Janeiro, Brazil, who is spending several months in this country studying library methods and procedures.

Lt. and Mrs. Albert G. Smith, Wright Field, Dayton, Ohio, visited the museum in early December to examine herpetological specimens. Lt. Smith, recently returned from combat duty with the 8th Air Force in England, holds the Air Medal with three Oak Leaf Clusters and the Distinguished Flying Cross. He is engaged in biological research with the Tropicalization Unit of the Materiel Command at Wright Field.

New Members

Sixty-two new members were elected at a meeting of the Board of Scientific Governors of the Academy on December 14, 1944:

Annual Members: Miss Edith M. Adams of Chicago and S. Glidden Baldwin, M. D., Danville, Illinois.

Associate Members: Mrs. J. Tracy Alexander, Billy Baasel, Charles E. Bacon, Mrs. H. S. Bartlett, Mrs. Harold W. Becker, R. H. Blakesley, Harry A. Chandler, I. D. Cotterman, W. N. Critchfield, Mrs. Eugenia Dominguez, John F. Downey, E. W. Flory, Henry Frasher, Mr. and Mrs. W. M. Fuller, George Giles, Fred Gotthardt, Miss Barbara J. Green, Miss Lillian B. Hamlen, Dr. and Mrs. E. E. Harwood, Mrs. M. Hill, William Hoferichter, Mrs. John Holland, Miss Katherine Jacobi, Henry Jensen, Miss Anna Kaminske, R. G. Kemper, Martin J. Klein, William Kodish, Mrs. Mary Kramer, Mrs. A. C. Lonert, Fred Mueller, E. L. Nelson, Miss Evelyn Peterson, Mrs. Elizabeth Poessel, Mr. and Mrs. E. A. Preston, Miss Minnie Richards, Miss Jean Saurwein, Miss Mildred Schuster, Mrs. Melissa Sennett, Mrs. Marie Sethersten, Miss Daisy L. Smith, Mrs. Laurette Waldmann, Fred E. Weise, Miss Mary Weise, Mrs. B. M. Wolff, and Mrs. V. D. Yarger—all of Chicago; A. Albert and Frank Hanel of Berwyn; Frank S. Chytil, Cicero; Mr. and Mrs. George G. Arnold, Elmhurst; Henry Krul and W. Burton Lewis, Evanston; B. R. Burns, Forest Park; Dr. Charlotte L. Grant, Dr. Ione J. Kral, and A. I. Means, Oak Park; Miss Jean Garrett, Villa Park; and A. N. Erickson, Moorhead, Minnesota.

The following *Honorary Life Members* were elected in appreciation of their contributions to the Academy in scientific services or generous gifts: Tappan Gregory of Northfield, Ill.; E. A. McIlhenny, Avery Island, La., and Donald A. Spencer, U. S. Fish and Wildlife Service.

On discontinuation of the "Active-Teacher" category last fall, H. L. Rogers and S. R. Harrington transferred their memberships to *Life*, Dr. William F. Petersen, Mrs. Noah Van Cleef, and Russel Tyson to *Annual*, and H. B. Conover, D. R. Scholes, and W. R. Carney to *Associate* membership.

The Academy entered 1945 with a membership of 412. Unless records prior to 1910 (not available at present) showed a larger membership roll, this is the greatest number of members in the Academy's history. The growth of over 17 per cent during 1944 is encouraging both in that it indicates approval and appreciation of the services and aims of this institution and in that it furthers financially the enlargement and improvement of these services both to members and the public. Funds received as membership dues support especially the Sunday Afternoon Lectures, children's programs, *The Chicago Naturalist*, and other educational activities not provided for by other sources of income.

A Tahitian Dictionary Published by the Academy

The Academy announces the publication on October 1, 1944, of "A Comparative Dictionary of the Tahitian Language," by Edmund Andrews, M. D. and Irene D. Andrews, xvi+253 pages, number six in the series of *Special Publications*. This dictionary results from studies initiated when Dr. and Mrs. Andrews made their first trip to the South Sea Islands several years ago. It consists of an introduction discussing Tahitian word formation and orthography (printed by letterpress), a Tahitian-English section and an English-Tahitian finding list (planographed). It is distributed to the libraries, museums and other organizations with which the Academy maintains exchanges and a limited number of copies are available for sale at $5.00 each.

The compilation includes a large number of Tahitian equivalents of medical terms and names of animals and plants which will be of considerable interest to medical men and naturalists. It is hoped that it may also be useful to members of the Armed Services on duty in the South Pacific.

Before his death in October, 1941, Dr. Andrews was professor of surgery at the School of Medicine of the University of Chicago. He was a vice-president of the Academy from 1928 to 1937. His grandfather, Edmund Andrews, was one of the founders of the Academy. Mrs. Andrews now lives in Los Angeles, California.

(Museum Activities continued on page 104.)

The Naturalist's Book Shelf

The Pacific World

Edited by Fairfield Osborn

W. W. Norton and Co., Inc., New York, 1944, 218 pages, seven color plates, numerous maps, charts and drawings, distribution and summary tables, index. Cloth, $3.00.

While designed to acquaint men in the military services with areas where they may be stationed, *The Pacific World* anticipates a post-war growth of American civilian interest in the richly varied life, terrain, resources, and potentialities of the Pacific regions—almost half of our world.

This volume and the series of supplementary handbooks now in preparation were initiated and sponsored by the American Committee for International Wild Life Protection. Twenty-eight scientists representing nine great American institutions assembled the comprehensive body of authoritative data which has been edited by Fairfield Osborn, president of the New York Zoological Society, into a concise and readable book of medium size.

The first half deals with the Pacific area as a whole—the Ocean; its islands and the history of their discovery and exploration; the climates, stars, and navigational factors; native peoples; ocean and land life. The latter half is devoted to descriptions of the nine regions comprising the Pacific World. It would seem that each of the twenty chapters, averaging ten pages in length, must of necessity be a mere thumb-nail sketch. This is not the case, for through discriminating research and expert authorship an amazing amount of fascinating, practical, and readily remembered information has been organized into a succinct yet integrated and smoothly-running coverage of each topic.

Harriet M. Smith

They Hop and Crawl

By Percy A. Morris

The Jaques Cattell Press, Lancaster, Pa., 1944, xiv, 253 pages, 4 line figures, 130 photographs. $3.50.

This book is about reptiles and amphibians. Its object is stated neither in the preface nor introduction, but the publisher's advertisement on the jacket begins: "As attorney for the defense, Mr. Morris has constructed a convincing story for snakes in the case of 'The People vs. Reptiles.' His plea is that the majority of this country's cold-blooded friends are not only harmless and inoffensive but actually beneficial." This scarcely comes under the heading of news, but undoubtedly there are millions of people not yet convinced of this fact, and the author apparently has made the defense of reptiles his main thesis. He has made a sincere effort to present these much maligned animals in the best possible light.

After the short introduction there are eight chapters with the following headings: Snake Fallacies, The Harmless Snakes, The Poisonous Snakes, The Crocodilians, The Lizards, The Turtles, The Toads and Frogs, The Salamanders. The index includes scientific and vernacular names.

Species selected for more detailed treatment seem to have been chosen arbitrarily with the emphasis on those of the eastern states. The publisher's statement that the reader is given "a clear picture of the many different kinds of reptiles and amphibians that are found here in the United States" is an exaggeration. In presenting the various species for discussion no systematic arrangement has been followed. Species belonging to a given genus are not always grouped consecutively; for example, on pages 50 to 56 three species of *Elaphe* are treated under

their respective names, then follow (pages 56 to 60) similar accounts of two species of *Pituophis*, then *Elaphe vulpinus* [*sic*], then *Liopeltis*, *Opheodrys*, one species of *Diadophis*, five of *Lampropeltis*, and (page 75) another *Elaphe*. The accounts of species include such topics as color, size, general distribution, food, young, and miscellaneous habits, partly based upon the author's personal experiences and partly drawn from published literature, although practically no sources of material are cited (four in footnotes) and there is no bibliography. A zoölogist looking here for original material would find some, but sorting it out as such would be a task.

The author's sources of taxonomic information seem to have been limited, for many obsolete names and combinations appear. To cite a few examples among the snakes, "*Natrix leberis* (Linnaeus)" is used for the queen snake which has been known to zoölogists as *N. septemvittata* (Say) at least since 1917; *Natrix fasciata* is treated as a distinct species, although it has been accepted as a subspecies of *N. sipedon* since 1917; the generic names *Virginia* and *Liopeltis* are retained, whereas they have been combined with *Haldea* and *Opheodrys*, respectively, since 1939. Furthermore, many of the Latin names are misspelled, eighteen in the index alone.

The photographs are by the author and the majority are good. However, those of the species having considerable red in their coloration (mud snake, scarlet snake, coral snake, and Gila monster) suffer for lack of differentiation of the red areas from the black. This could have been avoided by the proper use of panchromatic materials and filters. The photograph labeled western diamond-back rattlesnake, *Crotalus atrox* (page 107), appears to this reviewer to represent a specimen of the Pacific rattlesnake, *Crotalus viridis oreganus*.

In the absence of some indication as to the kind of audience to whom this treatise is addressed, a fair evaluation is difficult. It is not for naturalists. It is neither a field book nor a handbook: there are no keys for identification of genera or species, nor is there particular emphasis on definitive characteristics. Terminology for the principal plates and scales of snakes and turtles is indicated in figures 2 and 3, and for certain characters of frogs and toads in figure 4, but these terms are conspicuously absent from the text. Perhaps the book will appeal to those who like just to read about animals. It could have been made more useful had the author and editors sought the assistance of a herpetologist. In consideration of the present critical shortages of labor, paper, and engravers' metals it is unfortunate that a more satisfactory publication could not have resulted.

H. K. Gloyd

Our Country's National Parks

By Irving R. Melbo

Bobbs-Merrill Company, Indianapolis and New York, 1941, 2 vol., ix, 244 pages, index for each vol., bibliography and map for each chapter, numerous half-tones and diagrams. Cloth, $2.00 each.

Professor Irving Melbo of the Education Department at the University of Southern California spent ten years of intensive travel and study in preparing this comprehensive survey of our twenty-six National Parks.

A chapter is devoted to each park, and those which have the most in common are grouped as follows: Book One, 1. The Land of the Yellowstone, 2. The Majestic Underworld, 3. Fountains of Youth, 4. Wonderlands of the East, 5. Rainbows in the Desert, 6. The Land of the Little People (Mesa Verde); Book Two, 1. On Sierra Slopes, 2. The Shining Mountains (Northern Rockies), 3. The Old Fire Monsters.

Each chapter (of about twenty-five pages) includes a bibliography and maps of the park and has been checked for technical accuracy of content by the superintendent of the park concerned. They are most readable

accounts, much of the information being conveyed through anecdote and dialogue. While designed to meet the need of public schools for material on our National Parks which will be comprehensible to children from the fourth grade upwards, these books are not "juveniles." They do not "talk down," and their conversational style presents the information in much the same friendly, informal manner as it would be given on the spot by the park naturalist.

Harriet M. Smith

The Raft Book

By Harold Gatty

George Grady Press, New York, 1943, 153 pages, 26 plates (2 in color), numerous line drawings, diagrams, charts, navigation tables. Paper, $3.25.

The Raft Book was prepared by Harold Gatty, navigator of the Post-Gatty "Round-the-World Flight" and long-time resident of the South Pacific, to enable shipwrecked fighting men to find their way to land without instruments and without previous experience in navigation. The waterproof edition is reserved for installation in rafts and lifeboats, but a paper-bound edition has been made available to the public.

This handbook, through its wealth of information on the lore of the sea and the sky, makes "the open sea, anywhere in the world, a friendly place, full of life, and the means of maintaining and saving it." Navigational methods are those of the Polynesian voyagers—observation of the movements of star groups in bands, of the direction of migration of birds and insects and of the diurnal flights of shore-roosting birds, of surface life (birds, fishes, and vegetation), of prevailing winds, colors of water and mirroring sky, and other aspects of oceanic nature lore and their combined interpretation.

Mr. Gatty's simplified compilation of a large body of integrated data will be of interest not only to sailors and fishermen but to amateur naturalists, astronomers, and anthropologists of the interior.

Harriet M. Smith

A New Technical Publication

Another paper on the ant beetles of tropical America by Dr. Orlando Park, professor of zoölogy at Northwestern University and honorary curator of zoölogy of the Academy, was published as Volume 7, Number 4, of the *Bulletin of the Chicago Academy of Sciences*, on August 18, 1944. It is entitled "New and Little Known Pselaphidae (Coleoptera) from Brazil, Colombia and Mexico, with Keys to Mexican Genera and Species," and will be of particular interest to entomologists because of the descriptions of six new species and the systematic keys to the pselaphids known from Mexico.

The sales price of this publication is fifty cents, postpaid, but it may be obtained by active members of the Academy without cost upon request.

Members Please Note: The names of Academy members in the armed services are desired for listing in a forthcoming issue of the *Naturalist.* You can help by sending the name, rank, service (and, if permissible, the whereabouts) of men or women whom you think are Academy members. Please note any casualties. News items also are desired. If current addresses of service men can be supplied, the next two issues of the Naturalist will be sent directly to them.

The Chicago Naturalist

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